

Toxigenic *Corynebacterium ulcerans* in human and non-toxigenic *Corynebacterium diphtheriae* in cat

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Abstract

Corynebacterium diphtheriae and *Corynebacterium ulcerans* are rarely isolated from clinical samples in Belgium. A case of toxigenic *C. ulcerans* in a woman is described, which confirms that this pathogen is still present. During investigation of the patient's cats, only a non-toxigenic toxin-bearing *C. diphtheriae* strain was detected.

Keywords: Cat, *Corynebacterium diphtheriae*, *Corynebacterium ulcerans*, diphtheria, human

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Case Report

In May 2012, a 72-year-old woman presented with a chronic leg ulceration from which *Corynebacterium ulcerans* was isolated in

mixed culture with *Enterobacter aerogenes*, *Staphylococcus aureus* and *Streptococcus agalactiae*. No systemic symptoms were recorded. A booster with Tektivax pro adulto[®] was documented in 2007. She had no history of recent travel but was living in a trailer in poor hygienic conditions, with several cats. The condition of the patient improved quickly with oral amoxicillin.

The identification was confirmed as *C. ulcerans* by the National Reference Centre for *Corynebacterium diphtheriae*. The toxin gene was detected by conventional PCR [1]. A 900-base-pair (bp) PCR fragment of the toxin gene of *C. ulcerans* showed 100% identity with AB610405 and FJ858272 toxin gene sequences of *C. ulcerans* strains and 97% or less similarity with sequences from *C. diphtheriae* strains. As PCR is not an indicator of toxin expression, the strain was sent to the WHO Global Collaborating Centre for Diphtheria (Public Health England, London) for confirmation of toxigenicity by the Elek immunoprecipitation test.

All cultures from close contacts were negative. As *C. ulcerans*, a zoonotic pathogen [2–4], could be transmitted from animals, an attempt was made to screen the patient's four cats but only two could be captured. *Corynebacterium diphtheriae* biovar *mitis* was cultured from one. The toxin gene was detected but Elek testing was negative. Sequencing the complete toxin gene showed 99% sequence similarity to other *C. diphtheriae* toxin gene sequences but a 1-bp deletion at position 55 resulted in a prematurely terminated peptide at amino acid 38. Multi-locus sequence typing [5] of this strain resulted in ST40 (Table 1).

Since the outbreak in eastern Europe in the 1990s, only rare cases of *C. diphtheriae* have been observed in Europe [6]. The genus *Corynebacterium* comprises three species with toxigenic potential: *C. diphtheriae*, *C. ulcerans* and *Corynebacterium pseudotuberculosis*. *Corynebacterium ulcerans* has a broad host range and humans and other mammals can be infected [2,4]. Our patient was probably protected by her recent vaccine booster, as she did not present systemic symptoms. Although zoonotic transmission could not be proven here, this remains the most probable source of infection [2,3].

Curiously, a non-toxigenic *C. diphtheriae* strain was isolated from a cat, suggesting that humans might not be the sole reservoir. Such non-toxigenic feline isolates have already been reported [7], all presenting a 1-bp deletion at nucleotide 55 in the toxin gene, in spite of only 95% sequence similarity. This suggests that closely related toxin genes are present in the feline isolates and questions the role of cats as reservoirs for human infections.

This case report shows that immunization against diphtheria toxin remains important not only because of the threat of cases imported from other parts of the world but also because of the zoonotic potential of toxigenic *C. ulcerans* strains in Europe.

TABLE 1. Characteristics of the isolates

Strain	Source	Identification	Toxin PCR result	Elek result	Toxin gene sequence GenBank ref.	Multilocus sequence typing result
DIFT019	Human skin lesion	<i>Corynebacterium ulcerans</i>	+	+	889 base pairs KF013949	Not available
DIFT020	Nose swab from cat	<i>Corynebacterium diphtheriae</i> biovar <i>mitis</i>	+	–	1682 base pairs KF013950	ST40

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